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Two experiments were conducted to establish the psychological validity of the text type distinction. In the first, 20 college students sorted 12 texts on the basis of their similarities. The resultant sortings were subjected to a clustering analysis. Despite the fact that other bases for grouping texts existed--a number of pairs of semantically related texts of different types were included--text type emerged as a powerful determiner of group membership. In the second experiment, 13 students listened to recorded texts and then tried to recall them. As was predicted, text type had a significant effect on recall, with stories being recalled more fully than were instructions or definitions. (Three sample texts used in the experiments, together with their text structures and semantic representations, are contained in an appendix.)
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UNIVERSITY OF SOUTHERN CALIFORNIA

BEHAVIORAL TECHNOLOGY LABORATORIES

Technical Report No. 91

ON THE PSYCHOLOGICAL REALITY OF TEXT TYPES

February 1979

Allen Munro, Kathy A. Lutz, and Lynn Gordon

Sponsored by

Personnel and Training Research Programs
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of semantically related texts of different types were included--text type emerged as a powerful determiner of group membership. In the second experiment, students listened to recorded texts and then tried to recall them. As was predicted, text type had a significant effect on recall, with stories being recalled more fully than were instructions or definitions.

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I. INTRODUCTION

When reading a text, the literate person normally has a number of expectations about that text which may contribute to the reading process. There is often some expectation as to the topic matter of the text, since, in many cases, the text is selected because of an interest in the presumed topic. Usually a reader has some notion of how syntactically complex and how lexically abstruse a text is likely to be, based not only upon the expected topic, but also upon such factors as whether the work was apparently intended for children or for adults. Rumelhart (1977, 1978) has presented a theory of how these expectations and many others might all participate in the cognitive process of understanding texts. Another type of expectation, which, we believe, must influence the comprehension of and memory for texts, is expectation of text type.

There are many possible types of texts. Different people will have different conceptions of what constitutes a normal set of text types. For example, scholars are likely to have sets of expectations about the structures of technical articles in their fields. These expectations would include models for the prototypical format of the texts, topics to be covered, and the usual semantic relationships among major constituents of the texts. People who commonly read other types of texts can be expected to have well-developed sets of expectations about those types of texts as well; for example, some people have relatively precise representations for such diverse texts as regency novels, progressive labor party pamphlets, and horror comics. This plethora of possible distinct (and, to some extent, almost idiosyncratic) text types does not mean that

the phenomenon cannot be studied because every result will be buried in a mass of individual differences. We believe that, in a given culture,[1] there are likely to be a relatively small number of basic text types. The more specific text types, such as those mentioned above, can be thought of as subclasses of the basic text types.

We have studied three different basic text types in some depth thus far. They are stories, instructions, and definitional explanations. Stories are short, simple narratives with a principal protagonist who is confronted by a situation which inspires a certain goal. The protagonist makes one or more attempts at the goal, and some resolution is achieved. Simple folk tales are one kind of text of this basic type. The second type of text, instruction, ordinarily consists of a description of some desirable state and a sequence of actions, to be performed by the reader, which will result in the state. Short "how-to" articles are one kind of instructions. The third type of text we have studied is definitional explanations. These are short texts which define some unfamiliar object or process to the reader. Short popular science articles are a kind of definitional text.

The long range goals for our work on text types are, first, to learn whether text type does, indeed, play a role in text processing and in memory for texts, and, second, to learn what conceptual structures and cognitive processes are responsible for such text-type effects.

---

[1] Mandler, Scribner, Cole, & DeForest (1978) have presented evidence that suggest that at least one type of text, simple narrative, may have universal, cross-cultural characteristics.

Theory of text types

A complete text grammar should provide three levels of analysis: (1) the semantics; (2) the text structure; and (3) the sentential and lexical linguistic realization.

The semantics level deals with the actual information contained in each text. In general, the semantic content of a text can be specific or generic--typically stories convey specific information, while definitions and instructions convey generic information. Individual texts can be analyzed to provide representations of the information content of the text. We have chosen to represent the semantics of stories as semantic networks with many higher level causal, temporal and enabling relations between propositions and groups of propositions. Definitions and instructions are represented as schemata which consist of activateable subschemata. These take the form of lists of propositions primarily related by the sharing of arguments.

The text structure level consists of the ordering of information into appropriate units. This level represents the organization of the information according to appropriate conventions to produce the desired text-type. While the actual semantic content of stories differs, the organization of the kinds of information displays many regularities. Thus, a story (regardless of its particular content) usually consists of a setting, which 'sets' the action in time or space, and a plot. The plot consists of a purpose (which provides the impetus to the protagonist), an attempt (which provides a response to that impetus), and an outcome. In some sense, this corresponds to the old recommendation to anyone (in this culture) narrating something, to begin at the beginning,go through the middle,and stop at the end. This

advice would be useless for definitions, for example, since there is often no temporal or causal 'beginning.' Moreover, there is no overwhelming semantic reason for ordering the elements of a story this way; often the 'point' of a story is the outcome. According to this set of conventions, beginning with the outcome is inappropriate, but it is certainly possible to imagine a set of conventi[illegible] (in some other culture), which permit the introduction of a story by telling its outcome, as an emphatic device.

The linguistic realization of a text consists of the encoding of the ordered units of information into words, sentences, and super-sentential constituents. This level provides the appropriate lexical and syntactic realization of the information, based on the constraints of the general linguistic rules of the language and the constraints established by the intent and format of the text-type. This level would deal with such things as the high number of imperative clauses found in instructions. It is difficult to determine at this point to what degree the linguistic structure of texts is tied to their text-type, i.e., to what degree the lexical and syntatic facets of a text can be manipulated without influencing (or changing) the type to which the text is judged to belong. This level is one which we have given the least study--few real generalizations can yet be made which characterize text-types along these lines. Stories and instructions tend to have active verbs (both transitive and intransitive), while definitions are characterized more by stative verbs (including passive and copular forms). Instructions as noted above tend to have many imperatives (in our texts, about half of the clauses are imperatives), whereas the other two text-types rarely have any.

In recent years there has been a good deal of research on the grammar of simple texts. There have been two basic approaches to the problem. One group of investigators (including Frederickson, 1975, 1977, Kintsch, 1975, Kozminsky, 1977, McKoon, 1977, and Meyer, 1975) has emphasized the structure of the semantic representations of texts in memory. The second group, which includes Graesser (in press), Mandler & Johnson (1977), Rumelhart (1975), and Thorndyke (1977), has attempted to characterize both a level of semantic representation for texts and also a structural representation, which is meant to capture the constituent structure of the texts. This structural representation bears a similar relation to a text that a syntactic representation bears to a sentence in the theory of transformational grammar. The structural representation reflects the perceived constituent structure of a text, and, presumably, makes a contribution to its semantic interpretation.

It is important to remember that structural representations of texts do not have any existence independent from the mind of the reader. For the sake of brevity, we will sometimes refer to "the text structure of this text", and so on, below. The structural representations we present are meant only as a kind of static depiction of the process of constituent analysis during reading. Such an analysis is the product of constituency expectations (determined by the reader's perception of the type of the text) and the mental representations of the propositions of the text. In our theory, constituency judgements play an important role in supra-sentential semantics.

Most of the research on the structure of texts (particularly that done by those researchers who investigate both semantic and text structure representation) has dealt with only one type of text, namely simple narrative. Our goal has been to extend the theoretical approach developed by others to

deal with other types of texts as well. In Gordon, Munro, Rigney & Lutz (1978) we presented pilot evidence that suggested that more than one type of text structure must be postulated to account for differences in people's memories for different texts. According to the model presented in that study, hypothesized structural differences between the three types of text cause readers to remember some of the text types more easily than the others. The model posits structural representations for the three types of text and predicts that texts which possess greater structural hierarchy and greater semantic specificity are better remembered than text types which have a more linear structure.

The major thrust of the current study is to establish the psychological validity of the text type distinction. One experiment requires the readers to classify a number of texts into groups based on any perceived similarities. The directions in this experiment avoid any mention of a basis or scheme for classification, leaving the readers free to group texts as they wish. The analysis will determine how closely the groupings made by the readers match the hypothesized three categories of text. The second experiment tests for differences in memorability, as measured by free recall, for different types of texts. Specifically, the model predicts that stories will be recalled better than the other two types of text since stories have the greatest hierarchical structure and their semantic content is specific. Instructions, in turn, should be better remembered than definitional explanations since the elements or constituents in an instruction have some hierarchical organization compared to the linear structure of definitions. (See the sample structural representations in the Appendix.)

The reason that text structure affects memory is hypothesized to be due to the existence of text structure "schema" or mental expectations in

the mind of the reader. When the reader encounters a certain type of text, the successful reader recognizes the type and automatically uses prior knowledge about the structure of this type of text to facilitate further reading and memory. For example, when a story is encountered, the reader automatically expects to read about a plot and a setting. The reader implicitly knows that the plot will consist basically of a purpose, attempt, and outcome. These prior expectations represent a kind of higher level mental resource that aids the reading and memory process. The model does not imply that readers are consciously aware of these knowledge structures and expectations which help them read a story. On the contrary, schema or expectations about text structure are automatic, subconscious aids that the successful reader has learned to use to guide the reading efficiently and effectively. The reader can also use structural schema as recall aids because these schema serve as powerful pointers or cues to the informattion to be retrieved during recall.

Texts used in the experiments

In addition to using stories of the type studied by Rumelhart (1975, 1977b), Thorndyke (1977), and Mandler & Johnson (1977), this study investigates recall of definitional explanations and instructions. Several texts of each of these three types are identified and analyzed according to their structural and semantic characteristics. For each text chosen for use in this study, two representations are generated, including a semantic representation that is similar in many respects to representations used by Frederickson and others who emphasize the semantic structures of text. Samples of one text of each type, together with a text structure representation and a semantic representation are presented in the Appendix.

In obtaining the texts to use in these experiments, we were constrained by our decision to use naturally occurring texts. We have used texts from many sources; stories from a number of folk-tale and anecdote books from American mainstream tradition; definitions from encyclopedias, text books, and popular science magazines; and instructions from how-to books and popular magazines. We controlled for text length by equating texts on number of words. We also tried to provide shared semantic features across texts of different types. For example, one text selected was a story about a hedgehog, while another was a definition of hedgehogs. We did not, however, precisely control linguistic features such as lexical and syntactic complexity. Though it may not be possible to equate texts completely along syntactic lines (for example it is difficult to find instructions without imperatives and definitions with imperatives), it is possible to equate texts along lines of lexical complexity (the frequency of the meaningful lexical items) and syntatic complexity (the number and kinds of complex sentences found in the texts). However, we did apply an approximate measure of "difficulty" to the texts selected.

Two hypotheses about the psychological reality of text types

If text type is a valid psychological variable, one would expect it to influence a variety of information processing operations which people might apply to texts. A simple such operation is deciding how similar two texts are to each other. We hypothesized that text type could serve subjects as one acceptable feature by which the similarity of texts could be judged. We did not predict that text type would be the only feature which subjects might use in making such judgements, but we felt that it would be an important feature, even when it was compared with other

potentially important measures of similarity, such as the semantic relatedness of the topics of the texts.

Experiment I, reported below, was conducted to test this hypothesis. Subjects were required to sort texts into groups on the basis of their similarities. The data produced were subjected to a clustering analysis. Our prediction was that this analysis would show major clusters for the three types of texts we felt we had included (stories, instructions, and definitional explanations) and that these clusters would be evident despite competing similarities among the texts. These competing similarities were introduced by the presence of four pairs of semantically related topics, pairs which always crossed text type boundaries.

The second hypothesis about the psychological reality of text types has to do with the recall of different types of texts. In Gordon, Munro, Rigney, and Lutz (1978) a rationale is presented for expecting stories to be better recalled (in terms of proportion of propositions) than instructions and for instructions to be better recalled than definitions. These expected results follow from two principles: semantically specific information (as in definitions and instructions), and complex hierarchical structures should permit greater recall than flat structures. As the examples in the Appendix show, among the texts of all three types considered, we have observed consistent differences in the nature of the structural grammars trees that represent the texts. For texts of the same length (as determined by number of words or number of "propositions" or meaning units), stories and instructions have more hierarchical, more "vertical" structural representations while definitions appear to be more "horizontal". This hypothesis was tested in the earlier study (Gordon, et al. 1978), but only two texts of each type

(and those two different lengths) were used. In Experiment II, reported below, the experiment was conducted with nine texts, three each of each type. All of the texts were of approximately the same length. Confirmation of the two hypotheses stated here should add to the evidence for the psychological reality of text types.

II. EXPERIMENT 1: CATEGORIZING TEXTS

Readers are aware of many aspects of texts, of which the features associated with text type distinctions proposed in the model may constitute at best only a set. This experiment determines the subjective importance of text type differences relative to other characteristics of text such as subject matter similarities and differences. The purpose of the experiment is to determine if categories made by readers match those postulated in the model.

Subjects and procedure

Twenty undergraduate college students chose to participate in this experiment for credit in an introductory psychology class. Students were tested in groups of two to six. Each student received the same texts, but arranged in random order. Two sets of materials were distributed including the 12 texts and the answer sheets. Of the 12 tests, four were stories, four were definitions, and four were instructions. The 12 tests were typed on a half page and were headed by the title of the passage preceded by an identifying letter in parentheses. The titles and letter abbreviations are as follows:

Stories	Instructions	Definitions
(B) Borrowing a Horse	(D) Training a Dog	(A) Artesian Wells
(F) Free Help	(L) Studying for Lecture Courses	(C) Courtly Love
(T) The Boy and the Customs Officer	(M) Making a Planter	(H) Hedgehogs
(U) Unwelcome Guest	(S) Strawflowers	(N) Nematodes

Type of text is not the only basis on which the texts may be grouped. Readers can group the texts on the basis of subject matter similarities. The 12 texts were selected so that there were some similarities of topic matter. For example, one of the definitions describes the characteristics of hedgehogs while one of the stories presents a parable about a hedgehog.

The participants were asked to sort the texts into groups, starting with two groups and ending with eleven groups. First, the student made two groups out of the 12 texts, then three, then four, and finally on up to eleven. After each sort, the student recorded the text initials on the answer sheet. In addition, the student gave each grouping an identifying label and rated how appropriate the sorting seemed to be. These confidence ratings on the appropriateness of each grouping range from one to five with one indicating the most satisfactory grouping.

The instructions to the students were as follows:

> In front of you there are twelve short passages. Each of these passages is headed by a letter in parentheses and a title. We would like you to read them quickly for understanding. You will be rereading them during your task. We would like you to put these passages into groups. We are going to ask you to sort them first into two groups, and then into three, all the way up to eleven groups. For each sorting, please put all twelve passage into the groups and please put at least one passage in each group.
>
> Beside you, you can see the scoring sheets. At the top is a space for your name. Please write it in now. As you finish a sorting, please write down the letter associated with each text in the group to which you have assigned the passage.
>
> If you look at the first sheet, you can see that there is a space provided for writing in the letters of the texts, under the appropriate group. There is also a line which says 12. After you have finished grouping all the texts and writing them in, count the letters to make sure that you have grouped all twelve of them. If you have, then check the space marked 12. If not, go back and find out which passage you have omitted and put it into whichever group you feel it belongs to and then check the space marked 12.

We realize that some of the groupings you make may feel funny or unnatural since we are asking you to do this for so many different numbers of groups. So we have provided a place for you to express how satisfactory you feel the sorting is. 1 is the most satisfactory and 5 is the least.

In grouping the texts, you may want to pile the passages into groups or use some other technique for separating them up. Please remember to write down you groupings on the score sheet. After you have finished a sorting, please try to give a descriptive name to any group which has more than one passage in it. Read all the texts before you begin sorting.

Notice that no standard or basis for the sorting was suggested to the students. Using this vague directive, we expected that individuals would generate their own criteria for sorting.

Results

Students' groupings were converted to numbered scores for assigning the group number to each text placed in that group. For example, if the student sorted the first six of the texts into group 1 on the answer sheet and the second half into group 2, then the first six texts would be scored '1' and the second six would be scored '2.' So for each sort, each text was given a value between 1 and the number of groups in that sort. This scoring procedure yielded numbers whose relative value rather than absolute value is of interest. A program was written to compare the values for each text for each sort and construct a similarities matrix. For example, if story B and story T were grouped together in the first sort, their values for that sort would be the same. Similarly, their values would also be the same in sort 2 (possibly of a different value than in sort 1) if they were grouped together again. The resulting similarities matrix for all students across all sorts is given in Table 1. Notice that the value along the diagonal is always 200 because there are 20 students x 10 sorts (a text is always grouped with itself). The matrix is divided

Table 1

Similarities Matrix for Combined Sorts

		T	B	U	F	L	S	D	M	H	N	C	A
The Boy and the Customs Officer	T	200											
Borrowing a Horse	B	89	200										
Unwelcome Guest	U	113	77	200									
Free Help	F	82	63	75	200								
Studying for Lecture Courses	L	14	3	29	14	200							
Strawflowers	S	2	3	1	1	101	200						
Training a Dog to Heel	D	2	9	1	1	59	61	200					
Making a Concrete Planter	M	1	7	1	4	45	49	116	200				
Hedgehogs	H	6	55	6	5	24	35	42	35	200			
Nematodes	N	7	7	8	4	23	40	21	32	50	200		
Courtly Love	C	15	3	15	71	35	18	21	27	37	42	200	
Artesian Wells	A	8	11	9	10	29	18	44	51	43	45	96	200

into three sections corresponding to the three text types: stories, instructions and definitions. Visual inspection indicates that the twelve text passages were often grouped according to text type. The triangle in the upper left corner of the table indicates how often the stories were grouped together, the middle triangle corresponds to the instructions and the lower triangle indicates how often the definitions were grouped together. Visual inspection confirms that similarity scores are not evenly distributed, but rather, are grouped by text type.

To determine whether the students grouped the passages into the three predicted categories, a cluster analysis was performed. The minimum distance method was used in forming the clusters. The essence of the procedure is to merge objects which are most similar (separated by a minimum distance) and to treat this cluster as a single object in a new matrix. The process is then repeated, joining together the next most close objects, some of which may be clusters of other objects. The result of this procedure is a graphical presentation showing which elements cluster together, beginning with the clusters formed by the closest elements and proceeding to combinations of less closely related texts. Figure 1 shows the tree produced by clustering using the similarities matrix for combined sorts (found in Table 1). The correlations printed in the tree are scaled for 0 to 100. The similarity values on which the clusters were formed is given in Table 2.

The predicted result was that three overall clusters would be formed, corresponding to the stories, instructions, and definitions used in the experiment. A strong cluster for stories is evident in the results (see Figure 1). Although there were subgroups within the other two types,

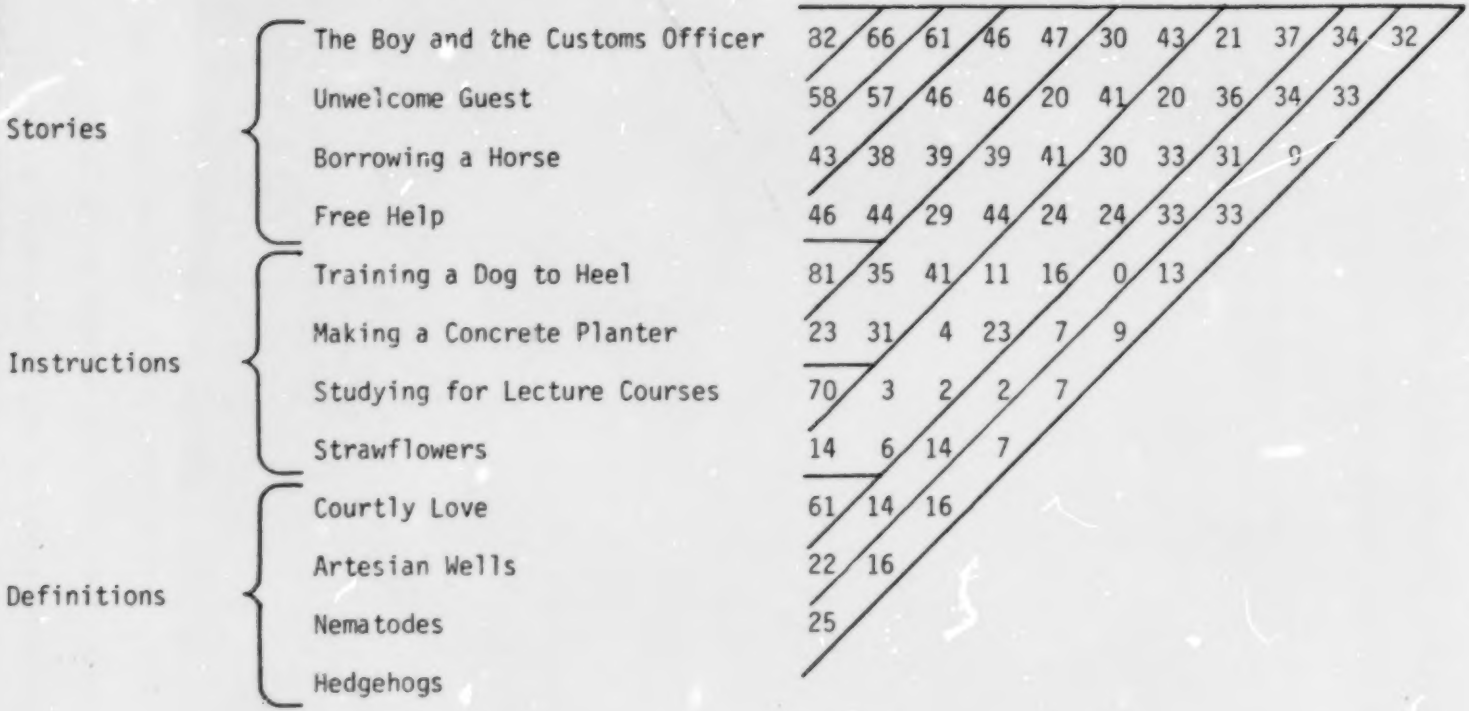


Figure 1. Tree produced by clustering for combined sorts

Table 2

Similarity Value on Which Clusters Formed for Combined Sorts

Text	Variable Number	Other Boundary of Cluster	No. of Items in Cluters	Similarity
The Boy & the Customs Officer	1	9	12	33.29
Unwelcome Guest	3	1	2	82.58
Borrowing a Hourse	2	1	3	66.16
Free Help	4	1	4	61.50
Training a Dog to Heel	7	8	2	81.24
Making a Concrete Planter	8	1	6	47.29
Studying for Lecture Courses	5	6	2	70.77
Strawflowers	6	1	8	44.09
Courtly Love	11	12	2	61.56
Artesian Wells	12	1	10	37.13
Nematodes	10	1	11	34.94
Hedgehogs	9	1	12	33.29

which did not cross over text type boundaries, the clustering analysis did not clearly demark the categories of instructions and definitional texts.

A second analysis was performed, using only the data generated when the students were asked to sort the twelve texts into three groups. Since this sorting allowed for a perfect matching of the texts to the predicted text type categories, it is important to examine the outcome of this sort. The similarities matrix for the three-group sort is found in Table 3 and the tree produced by clustering (as above for Figure 1) is presented in Figure 2. The similarity values on which the clusters were formed is given in Table 4. The results conform closely to our predictions.

Discussion

The intent of this experiment was to determine the extent to which unprompted readers recognize the distinctions between texts, in particular between types of texts. In the instructions, the experimenter provided no hint of a criterion on which to sort the texts. The instructions were deliberately vague in order to discover the salient features of the texts to the students (and, therefore, to confirm independently the hypothesized text-type membership of these texts).

It was verly likely that the judgements made by the students could have been made on semantic grounds. In other words, the particular semantic characteristics of the texts selected for use in the experiment could influence or bias the sorting. In addition to text type, there were other bases available for grouping texts together. For example, we deliberately ensured that there were close semantic relationships among the topics of pairs of texts of different types: a story and an instruction both dealt with dogs; one of the stories and a definition both involved hedgehogs; one story and a definition are centrally concerned with wells.

Table 3

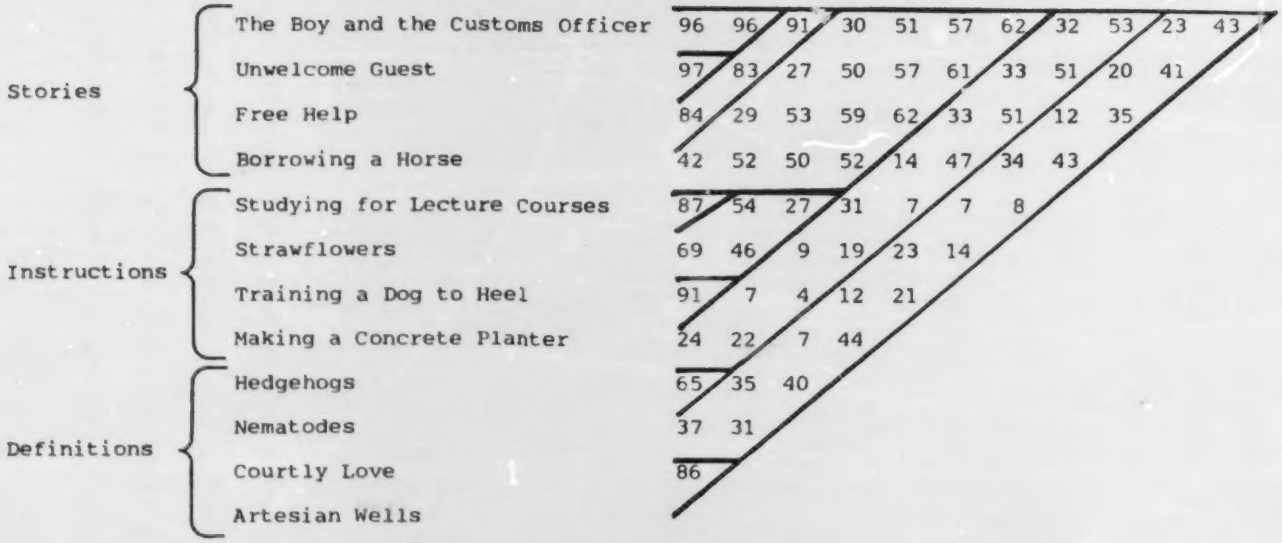
Similarities Matrix for 3-Group Sort

		T	B	U	F	L	S	D	M	H	N	C	A
The Boy and the Customs Officer	T	20											
Borrowing a Hourse	B	15	20										
Unwelcome Guest	U	16	11	20									
Free Help	F	16	12	16	20								
Studying for Lecture Courses	L	3	0	3	3	20							
Strawflowers	S	0	0	0	0	15	20						
Training a Dog to Heel	D	0	1	0	0	9	11	20					
Making a Concrete Planter	M	0	1	0	0	5	7	16	20				
Hedgehogs	H	2	5	2	2	1	3	5	6	20			
Nematodes	N	0	0	0	0	2	6	2	5	10	20		
Courtly Love	C	3	0	3	5	5	1	2	4	7	7	20	
Artesian Wells	A	1	1	1	2	3	1	6	9	7	5	15	20

Table 4

Similarity Value on Which Clusters Were Formed for 3-Group Sort

Text	Variable Number	Other Boundary of Cluster	No. of Items in Clusters	Distance of Similarity When Clusters Formed
T	1	12	12	44.89
U	3	4	2	97.20
F	4	1	3	96 74
B	2	1	4	91.83
L	5	8	4	69.60
S	6	5	2	87.59
D	7	8	2	91.49
M	8	1	8	62.50
H	9	10	2	65.92
N	10	1	10	53.02
C	11	12	2	86.44
A	12	1	12	44.89


Stories
Instructions
Definitions
The Boy and the Customs Officer 96 96 91 30 51 57 62 32 53 23 43
Unwelcome Guest 97 83 27 50 57 61 33 51 20 41
Free Help 84 29 53 59 62 33 51 12 35
Borrowing a Horse 42 52 50 52 14 47 34 43
Studying for Lecture Courses 87 54 27 31 7 7 8
Strawflowers 69 46 9 19 23 14
Training a Dog to Heel 91 7 4 12 21
Making a Concrete Planter 24 22 7 44
Hedgehogs 65 35 40
Nematodes 37 31
Courtly Love 86
Artesian Wells

Tree produced by clustering for 3-group sort

In examining the results of the clustering analysis, it is clear that the students (without prompting) converged on the three text-type distinctions which we have postulated, at least in the three-group sort. In the analysis of all the sortings the results are not altogether clear, perhaps, in part, because there are fewer opportunities for all and only the texts of a given type to be grouped together. On the other hand, all the discrete groupings in both analyses (Figures 1 and 2) consist of members of the same type. That is, there is no evidence of cross-type grouping.

The second sorting (into three groups) allows a much clearer observation of the effects of text type--there is no obstacle to the assignment of the texts into type-defined groups. Inspection of Figure 2 demonstrates the unity of the stories and instructions as a group. Definitions which have much less hierarchical (and, thus, less clearly marked) structure and fewer semantic and syntactic cues as to their type-membership are not as clear-cut as in the other two types However, these texts do form clusters--Hedgehogs with Nematodes (possibly a semantic grouping--both are descriptions of living beings) and Courtly Love with Artesian Wells.

It is significant that clustering within our predicted text types was stronger than clustering across test type boundaries, despite the existence of other, topical, relationships among texts of different types. We take these results as encouragement for the hypothesis that these text types are psychologically distinct.

III. EXPERIMENT 2: RECALLING TEXTS

In our previous research on recall of tests (Gordon, et al. 1978) students were required to recall at most six texts, two each of the three types we have studied. Furthermore, in those experiments the two texts of each type were of quite different lengths. In this experiment, nine of the texts used for Experiment 1 were employed. Each type of text was therefore represented by three specific texts. An attempt was made to select texts so that a range of difficulty was represented by the texts of each type. An analysis of "difficulty" (see "Equating Passage Difficulty") shows that this effort succeeded.

Our predictions for this experiment were that text type would have a significant effect on recall of the texts. We expected stories to be recalled best, followed by instructions, with definitions the least well recalled type of text.

Subjects and procedure

Thirteen undergraduate college students participated voluntarily in this experiment for credit in an introductory psychology course. All students received the same treatment since this is a completely within-subjects design. The two factors in this design are text-type (story, instructions, definition) and materials (three different passages of each text type).

The students were tested in groups of four to six. They were told that they would hear a number of passages and were instructed to listen carefully and attempt to remember as much as possible. They were informed that they would be asked to provide as near verbatim a recall as possible

for each of the texts. The nine passages used in the experiment were presented via a tape recording. After each text was presented orally, the students were given a one-minute intervening task which consisted of adding a page of 3-digit number problems. Then, they wrote out everything which they could recall from the text, as completely and exactly as they could. Unlimited time was provided for recall. The texts were presented in this order on the tape:

Borrowing a Horse, Making a Concrete Planter, Courtly Love, Unwelcome Guest, Training a Dog to Heel, Artesian Wells, The Boy and the Customs Officer, Studying for Lecture Courses, and Hedgehogs.

Equating passage difficulty

Memory for texts can be influenced by a number of factors other than text type as discussed earlier. One major influence on recall is passage difficulty level as determined by such factors as word frequency, lexical complexity, and sentential syntax. An attempt was made to equate the nine passages used in this experiment on the basis of difficulty. One simple, but rather accurate, method for assessing the difficulty level of a passage is the Fry Formula for Estimating Readability. This method defines difficulty in terms of linguistic factors such as syllable count and sentence length. This approach is based on the assumption that passages containing words with more syllables and longer sentences are more difficult to read.

The Fry method yields a numerical grade level for a passage from grades 1 through 17. The intent of assessing passage difficulty in this experiment is not to categorize or label each passage according to a general grade level but rather to estimate and compare the relative

difficulty of the nine passages. Therefore, the Fry approach has been used only to yield the raw scores rather than using the Fry Readability Scale to determine the resultant categories for those raw scores. The procedure used to estimate passage difficulty following the Fry approach is as follows:

1. Count out 100 words of the passage, beginning with the start of a sentence. Count numerals, initials, and proper nouns.
2. Count the number of sentences in the 100 words, estimating length of the fraction of the last sentence to the nearest 1/100th.
3. Count the total number of syllables in the 100-word segement.
4. Divide the result of (3)--the syllable count--by the result of (2)--the sentence count--to yield the raw difficulty score.

These raw difficulty estimates for each of the nine passages are given in Table 5, along with the mean difficulty level for stories, instructions, and definitions. A one-way ANOVA comparing the means for the three groups revealed no significant differences in mean difficulty level between the three types of text, F (2,6) = .12, N.S. Although the mean difficulty ratings do not differ significantly between the three groups, a visual inspection of the means indicates that the stories are most difficult, followed by instructions, and then, definitions (a higher score means the passages possess greater difficulty). Since our hypothesis is that the stories text-type will be recalled best, a slight difference in the difficulty, in this direction (i.e., stories are slightly more difficult) is desirable because any obtained recall superiority for stories, then, cannot be a function of "easier" passages.

Table 5

Difficulty Estimates for Individual Passages and Categories of Text-Type

Text Type	Passage Title	Difficulty	Mean Difficulty
Stories	Borrowing a Horse	23.29	
	Unwelcome Guest	32.80	24.92
	The Boy & the Customs Officer	18.66	
Instructions	Making a Concrete Planter	20.31	
	Training a Dog to Heel	18.64	23.15
	Studying for a Lecture Course	30.49	
Definitions	Courtly Love	23.14	
	Artesian Wells	18.21	22.54
	Hedgehogs	26.28	

Results

To score the students' free recalls, a set of standards was used to first determine the propositions contained in each text passage; the students' written productions were then scored for inclusion of those propositions. Basically, a proposition is defined as any clause containing a verb (additional rules are detailed in Gordon, et al. 1978). In addition to determining the number of propositions that each student recalled from each passage, we also scored the recalls for inclusion of terminal nodes. A terminal node is defined as the lowest structural element in the text structure of each type of text. The terminal nodes found at the bottom of the sample text structures in the Appendix are typical components for each text type. A given terminal node can be represented in the text by one or more propositions. When students included one or more propositions that were part of a terminal node of a text, we scored that node as being present. Therefore, for each of the nine texts, recalls were scored for the presence of both structural terminal nodes and propositions. Raw recall scores were converted into ratio scores of the number of propositions or terminal nodes included in the recall to the total possible number of propositions or terminal nodes in each particular text. The means of the students' ratio scores for propositions recalled from each of the nine passages are shown in Table 6. The means of the students' ratio scores for terminal nodes recalled from each passage are shown in Table 7. A graph of the data is presented in Figures 3 & 4. Visual inspection indicates that our expectations were confirmed, in that, stories were generally recalled better than instructions which appear to have been recalled better than definitions. To test this conclusion, a one-way

TABLE 6

MEANS AND STANDARD DEVIATIONS

OF PERCENT PROPOSITIONS RECALLED

TEXT TYPE	PASSAGE TITLE	MEAN	S.D.	TEXT TYPE MEAN
Stories	Borrowing a Horse	41.35	(20.71)	
	Unwelcome Guest	49.08	(18.24)	51.21
	The Boy and the Customs Officer	63.20	(12.93)	
Instructions	Making a Concrete Planter	26.03	(10.97)	
	Training a Dog to Heel	50.24	(15.47)	29.68
	Studying for a Lecture Course	26.15	(11.48)	
Definitions	Courtly Love	14.98	(9.65)	
	Artesian Wells	49.52	(15.36)	34.14
	Hedgehogs	24.55	(11.48)	

TABLE 7

MEANS AND STANDARD DEVIATIONS

OF PERCENT TERMINAL NODES RECALLED

TEXT TYPE	PASSAGE TITLE	MEAN	S.D.	TEXT TYPE MEAN
Stories	Borrowing a Horse	53.85	(21.34)	
	Unwelcome Guest	67.12	(22.65)	67.10
	The Boy and the Customs Officer	80.35	(11.69)	
Instructions	Making a Concrete Planter	36.77	(13.23)	
	Training a Dog to Heel	56.68	(12.56)	32.70
	Studying for a Lecture Course	42.01	(17.65)	
Definitions	Courtly Love	25.65	(12.92)	
	Artesian Wells	47.58	(22.32)	45.15
	Hedgehogs	24.86	(8.88)	

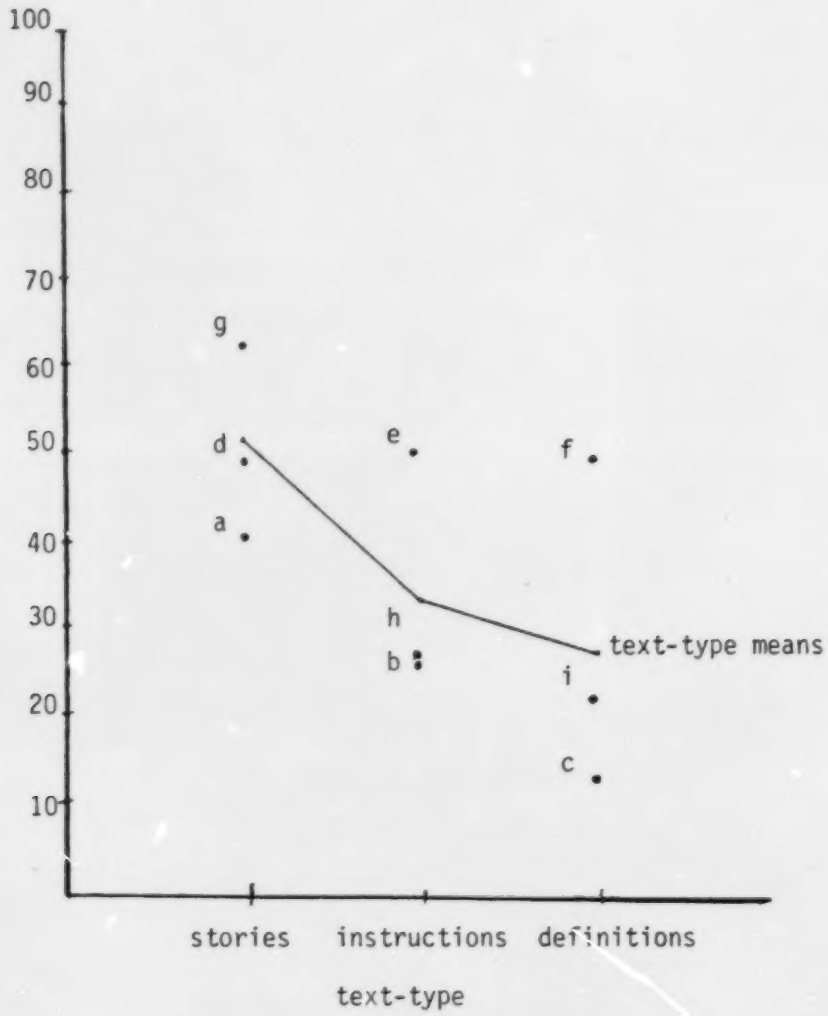


Figure 3 Mean percent of propositions recalled for each text and each text-type

a. Borrowing a Horse (story)
b. Making a Concrete Planter (instruction)
c. Courtly Love (definition)
d. Unwelcome Guest (story)
e. Training a Dog to Heel (instruction)
f. Artesian Wells (definition)
g. The Boy and the Customs Officer (story)
h. Studying for Lecture Courses (instruction)
i. Hedgehogs (definition)

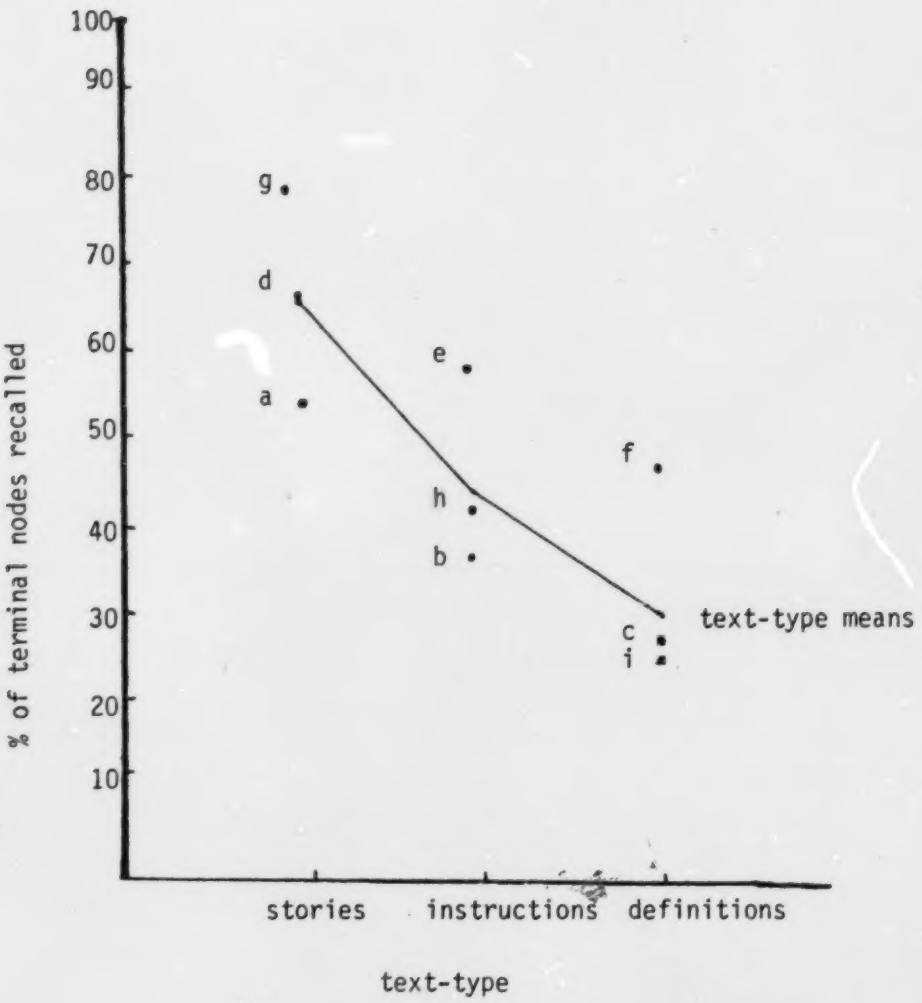


Figure 4 Mean percent of terminal nodes recalled for each text and each text-type.

a. Borrowing a Horse (story)
b. Making a Concrete Planter (instruction)
c. Courtly Love (definition)
d. Unwelcome Guest (story)
e. Training a Dog to Heel (instruction)
f. Artesian Wells (definition)
g. The Boy and the Customs Officer (story)
h. Studying for Lecture Courses (instruction)
i. Hedgehogs (definition)

ANOVA compared the mean recall scores which were obtained by collapsing scores for the three passages of each type into one, mean score. In other words, each student's mean recall of stories was compared to his or her mean recall of instructions and mean recall of definitions. This within-subjects factor of text type did significantly affect recall of both terminal nodes, F (2, 24) = 7.08, $p < .01$, for terminal nodes, and F (2, 24) = 42.70, $p < .01$, for propositions.

Discussion

In this experiment, a measure of level of difficulty was used to ensure that the texts of different types were of approximately equivalent reading levels. The texts were all of about the same length. Nonetheless, the prediction that text type would significantly affect amount recalled was born out by the results of the experiment. As was expected, stories were recalled to the greatest extent, instructions next, and definitions were the least well recalled. These results support the contention that these text types affect memory for text.

The results of the two experiments reported here, together with the evidence presented in Gordon, et al (1978), provide convincing support for text type as a valid psychological construct.

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APPENDIX

Three Sample Texts Used in the Experiments, Together With Their Text Structures and Semantic Representations

Three Sample Texts

The texts are presented here divided into their component propositions, following the method described in Gordon, et al (1978). The numbers of the propositions may be referred to in the corresponding text structure representations.

The Boy and the Customs Officer (A Story)

1. A boy went to market one day
2. to sell a lamb,
3. leading his dog along
4. on a leash.
5. On the way,
6. he thought about how to get into town
7. without paying any duty
8. on the lamb.
9. Arriving
10. near the customs house,
11. he picked up the lamb,
12. tied it up,
13. and hid it
14. under a bush.
15. Then he took his dog
16. and put it into his bag.
17. The boy opened his bag,
18. and the dog jumped out
19. and ran off.
20. "Now look
21. what you've done,
22. cried the boy,
23. "I promised that dog to a gentleman
24. in town.
25. Now he's escaped
26. all because of your customs check!"
27. "Go
28. and fetch him,"
29. said the customs man,
30. "there's no duty
31. on dogs."
32. So the boy went back,
33. picked up the lamb
34. and put it in his bag.
35. "You're lucky
36. I caught him,"
37. scolded the boy
38. as he returned to the customs house.
39. The customs man thought
40. the boy had the dog in his bag,
41. and so he let him into the town
42. without paying duty.

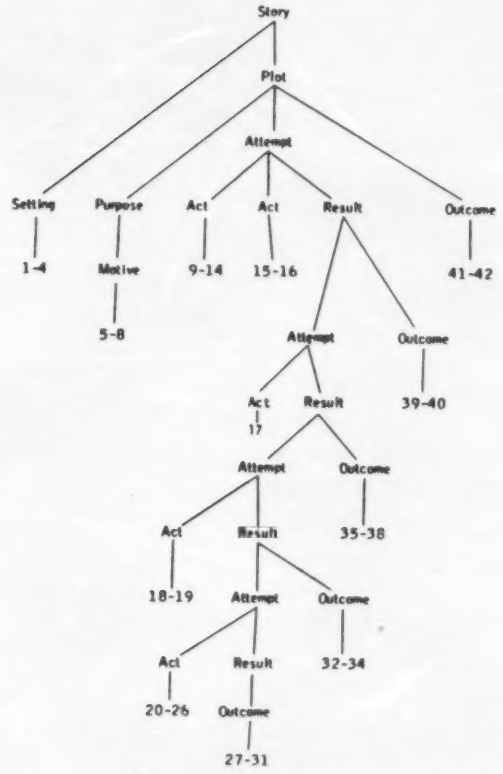
Studying for Lecture Courses (An Instruction)

1. What should you do in a study period
2. immediately after a lecture?
3. You should review the notes
4. which you took in class,
5. first of all making sure
6. that you understand them.
7. Don't assume
8. since you were able to follow all the principal points
9. made by the lecturer in the class,
10. that you have, in fact, assimilated all of them.
11. It is easy
12. to fall into this trap
13. and to deceive yourself
14. into thinking
15. that you have learned more than
16. you actually have.
17. In most cases,..... you will need,
18. unless the lecturer is unusually well organized
19. and you are a top-notch note-taker,
20. to revise
21. or rewrite your notes.
22. In revising your notes,
23. eliminate any of them
24. which now seem trivial
25. or unimportant,
26. and expand those
27. which you now can see
28. are important.
29. You should do this
30. while the lecture is still fresh in your mind
31. since you will find it a hopeless task
32. if you let
33. time pass
34. (and with it your memory).
35. In rewriting your notes,
36. reorganize them
37. so that they are more legible,
38. better arranged,
39. in more useful condition
40. for subsequent review.

Courtly Love (A Definition)

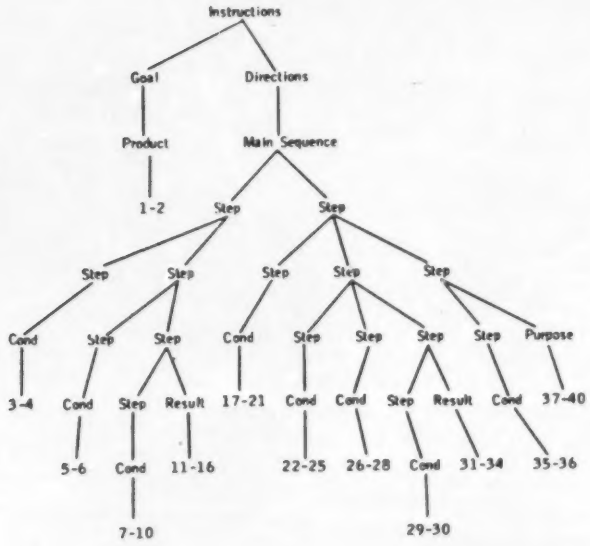
What was courtly love?
It was a system
or cult of love.
It was a sentiment of a specialized kind
which was created by the poets at a particular period.
It was predicated upon a recognized social structure--
the feudal society.
An aristocratic cult,
it excluded from its mysteries all those of common birth
or humble station.
Only the "gentle" were capable of love
and not all of those,
for the perfect knight was compelled
to follow...(15)...the prescribed ritual of the cult
carefully.
The service of love, indeed, was like that of a vassal to his lord:
the lover must be subservient to the desire,
even to the whim of his lady.
"Courtesy"
and humility were among the chief characteristics of this love.
Courtesy could be obtained only by the knight
who was well-born
and trained in courts.
It was conferred by love
and demanded gentility.
The knight swore
to protect all gentle ladies
and to obey...(29)...the commands of his lady in the service of love
without question.
With great humility
he must accept her praises
and condemnations alike.
He reverenced her almost as a deity.

'THE BOY & THE CUSTOMS OFFICER'



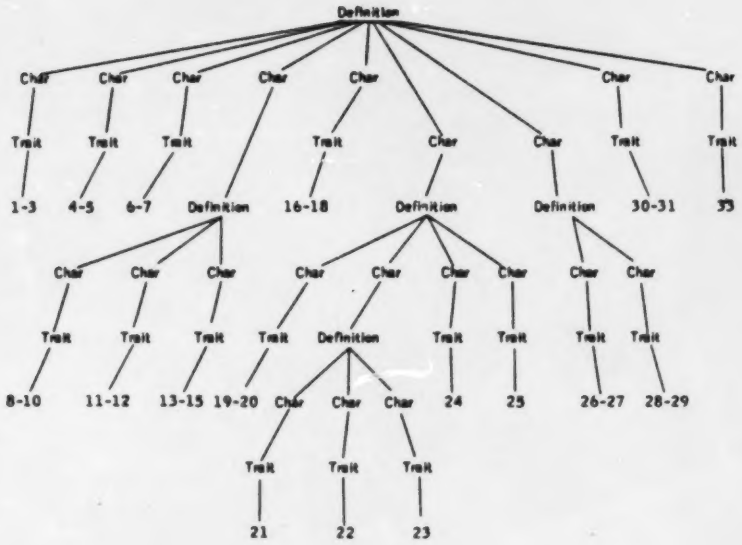
The text structure of a story used in the experiments.

'STUDYING FOR LECTURE COURSES'

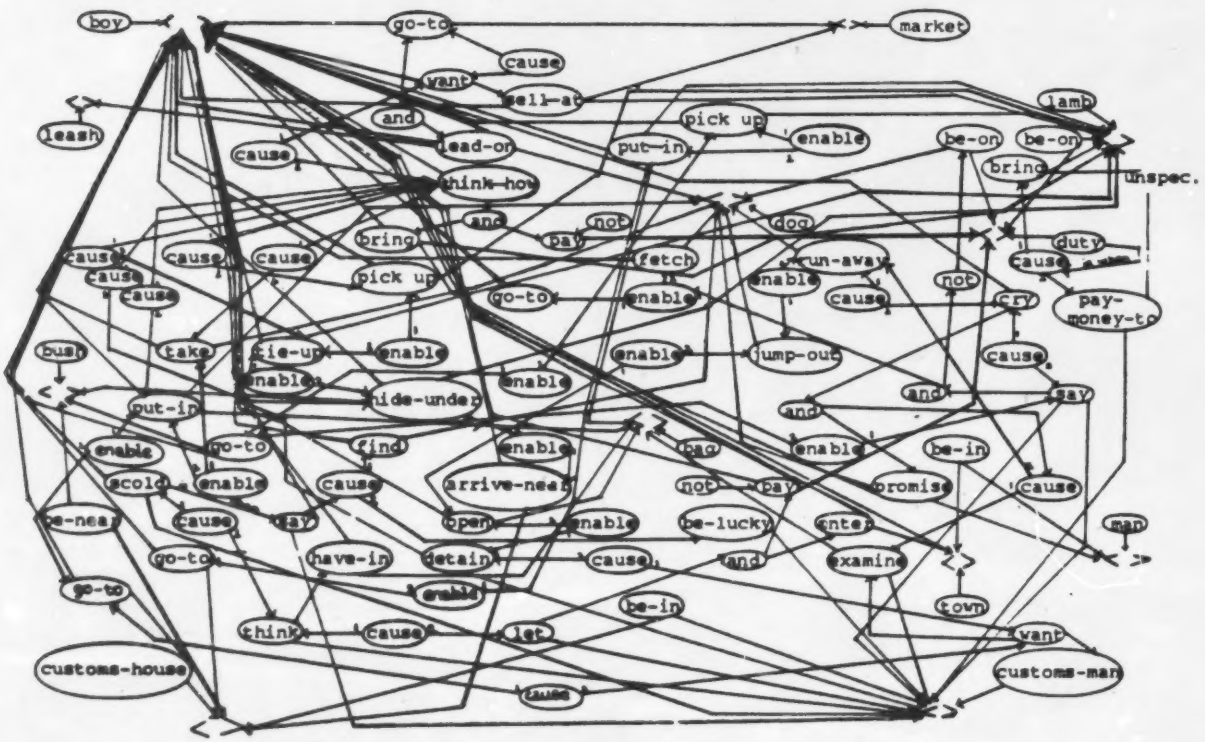


The text structure of a definition used in the experiments.

'COURTLY LOVE'



The text structure of an instruction used in the experiments.



Semantics of "The Boy and the Customs Officer"

```
COURTLY LOVE (x)
      is when
OR (LOVE-SYSTEM (x), LOVE-CULT (x))
SPECIALIZED-SENTIMENT (x)
CREATE (POETS (PARTICULAR PERIOD), x)
PREDICATE-ON (POETS, x, FEUDAL SOCIETY)
ARISTOCRATIC-CULT (x)
EXCLUDE (x, FROM MYSTERIES (x), OR (POEPLE (COMMON-BIRTH), PEOPLE (HUMBLE STATION)))
CAPABLE-OF (ONLY (GENTLE), x)
CAPABLE-OF (NOT (ALL GENTLE)), x)
COMPEL (x, PERFECT-KNIGHT, CAREFUL (FOLLOW (PERFECT-KNIGHT, RITUAL (x)))
BE LIKE (SERVICE (x), SERVICE-TO (VASSAL, LORD))
SUBSERVIENT-TO (LOVER, OR (DESIRE (LADY), WHIM (LADY)))
CHIEF-CHARACTERISTICS (x, AND (COURTESY, HUMILITY))
CONFER (x, COURTESY)


FEUDAL SOCIETY (x)
      is when
RECOGNIZED-SOCIAL-STRUCTURE (x)
COMPOSED-OF (x, AND (COURT, AND (AND (LORDS, LADIES), RETAINERS
      (ATTACHED-TO (RETAINERS, COURT)))))


PERFECT-KNIGHT (x)
      is when
CAPABLE-OF (x, COURTLY LOVE)
LOVER (x)
GENTLE (x)
COMPEL (COURTLY LOVE, x, CAREFUL (FOLLOW (x, RITUAL (COURTLY LOVE))))
BE SUBSERVIENT (x, DESIRE (LADY (x)))
BE SUBSERVIENT (x, WHIM (LADY (x)))
ATTAIN (ONLY (x), COURTESY)
WELL-BORN (x)
TRAINED (x IN COURTS)
SWEAR (x, PROTECT (x, ALL (GENTLE LADIES)))
NOT (SWEAR (x, PROTECT (x, ALL (WOMEN))))
SWEAR (x, WITHOUT QUESTION (OBEY (x, COMMANDS (LADY (x) INSERVICE OF LOVE))))
HUMBLE (ACCEPT (x, AND (PRAISES (LADY (x)), CONDEMNATIONS (LADY (x)))))
LIKE (REVERANCE (x, LADY (x)), REVERANCE (x, DEITY)


COURTESY (x)
      is when
CHIEF CHARACTERISTICS (COURTLY LOVE, AND (x, HUMILITY))
ATTAIN (ONLY KNIGHT (AND (TRAINED (KNIGHT, IN COURTS),WELL BORN (KNIGHT))), x)
CONFER (COURTLY LOVE,x)
DEMAND (x, GENTILITY)
```

The semantic representation of "Courtly Love".


```
STUDYING-FOR-LECTURE-COURSE (STUDENT, LECTURE)
      is when
IMMEDIATE (AFTER (DO (STUDENT, x), LECTURE))
REVIEW-LECTURE-NOTES (STUDENT, NOTES (LECTURE))
REVISE-LECTURE-NOTES (STUDENT, NOTES (LECTURE))


REVIEW-LECTURE-NOTES (STUDENT, NOTES)
      is when
ENSURE (STUDENT, UNDERSTAND (STUDENT, NOTES))
NOT (ASSUME (STUDENT, BECAUSE (ABLE (STUDENT (FOLLOW (STUDENT, PRINCIPAL-
      POINTS (MADE (LECTURER, POINTS, IN CLASS))))), ASSIMILATED (STUDENT
      (ALL (PRINCIPAL-POINTS))))))
EASY (FALL-INTO (STUDENT, TRAP))
EASY (DECEIVE (STUDENT, STUDENT, MORE-THAN (THINK, STUDENT (LEARN (STUDENT,
      Q1)), LEARN (STUDENT  Q2))))


REVISE-LECTURE-NOTES (STUDENT, NOTES)
      is when
IN-MOST-CASES (NECESSARY (x))
UNLESS (AND (UNUSUAL (WELL-ORGANIZED (LECTURER)), TOP-NOTCH (NOTE-TAKER
      (STUDENT))), NECESSARY (x))
ELIMINATE (STUDENT, NOTES (OR (TRIVIAL, UNIMPORTANT)))
EXPAND (STUDENT, NOTES (IMPORTANT))
WHILE (STILL (FRESH (LECTURE, MEMORY (STUDENT))), DO (x))
IF (ALLOW (STUDENT (PASS (TIME))), HOPELESS (x))
IF (PASS (TIME), DECAY (MEMORY (STUDENT)))
REORGANIZE(STUDENT, NOTES)
MAKE (STUDENT, AND (MORE (LEGIBLE (NOTES)), BETTER (ARRANGED (NOTES)), MORE
      (USEFUL-FOR (NOTES, SUBSEQUENT (REVIEW)))))
```

The semantic representation of "Studying for Lecture Courses"